Tipitara, just in the same way that it itself aliments the river San Juan in its descent to the Atlantic.

The level of the Lake of Nicaragua is, according to the calculations of Mr. Baily, the engineer. 36 metres above the level of the Atlantic, and thirty eight metres above that of the Pacific, whence there results a difference of about two metres between the levels of the two oceans.

The Lake of Nicaragua, therefore, according to the Belly scheme, will constitute an immense upper source of alimentation for the canal. Its level varies in the course of the year between two extreme limits, the difference between which does not exceed two metres, and it attains its maximum at the end of the rainy season. During the dry season the evaporation of this immense su ace not being compensated for by an equal increase of its affluents, its level sinks nearly two metres below the highest water mark: but below this limit the basin of the take presents a variable depth exceeding ten metres. On the line of the proposed canal an American engineer, Mr

the line of the proposed canal an American engineer, Mr. Child, has found depths of eighteen metres, and it is to be resumed that towards the centre greater depths are to be met with. Mr. Baily, it is stated, has sounded a depth of eighty, our metres in the middle of the lake.

With the exception of a few points offering favorable archoring places, the shores of the lake are in general int, and accessible only to small vessels—a fact which will necessitate the dredging of a channel, in order to lower the bed of the lake, at each of its points of junction with the two branches of the canal.

The making of these channels will be the more easy from the fact that the bed of the lake towards the south is a recent alluvial deposit, the increase of which constantly continues, alimented as it is by the soil which decends from the forests bordering its alluents.

The auxiliary channels will be made by the aid of the steam dredge. They will be protected at their starting puops.

The total cost of these auxiliary works on the lake.

ng buoys.

The total cost of these auxiliary works on the lake, ooth for timber work and dredging, will be \$500,000. EASTERN BRANCH OF THE CANAL.

The eastern branch of the canal will be the bed itself of the river San Juan. This river, from its point of depar ture at San Carlos to the port of San Juan del Norte or the Atlantic describes two inverted curves, the direct length of which is 145 kilometres, but the numerous sinnosities of which extend it to the full measurement of 175 kilometres. The difference it is seen, 36 metres 50 cent, the mean inclination of the natural current of the river San Juan is as one in five thousand of its course. This would be a steep incline and a costly ascent for vessels. But this mean inclination is not a natural one; the bed of the river is obstructed in its upper region by bars of rocks, at times reaching the sur-face of the water. These bars modify the current, which precipitates itself in successive falls, of difficult access, while in the greater part of its course the water of the

chile in the greater part of its course the water of the iver is waveless.

Three systems offer themselves to the examination of the engineer for the canalization of the river San Juan:

The pure and simple improvement of the natural ourse of the river. 2. Canalization by means of locks. Canalization by an uninterrupted current. To this atter proposition the scheme before us inclines.

This plan, M. Belly says, is worthy of the most serious xammation, inasmuch as it involves the adoption of a nixed system which meets all the local difficulties of the coate.

In view of the requirements of a canal calling for a reat draught of water, the régime of the river Sar ioan can only be maintained according to the natural in-simation of one in five thousand. The total recovery of his incline by means of a system of falls effected by locks this incline by means of a system of talls effected by locks is not very practicable, in so far as it concerns the prompt filing of the intervening distances. Bars must in that case be resorted to; and in doing this the engineer would only be generalizing by normal conditions, the natural regime existing in the rapids of the upper basin; but these bars would have to be equally distributed according to the general state of the canal banks over the entire course of the river, the current of which they would regulate.

The adoption of a mixed system permits the obtainment of the desired depth by the lowering of the bed of the river, as well as by the excess of elevation given to the surface of the water by means of the embankments of the dams.

e Belly plan proposes the construction of seven bars se course of the San Juan, including the protecting e, to be erected at the sea. cording to this plan the five rapids of Toro, Castillo, s. Mice and Machinea will be redeemed by three asing locks.
o other locks will also be established above the con

debonohe of the river at San Juan del Norte, on the Atlantic.

By means of these seven dams, the current of the river will be regulated to a decline of one in seven thousand. This current is sufficiently feelle to offer small resistance to the towing of vessels, but it will be nevertheless sufficient to maintain all obstructing matters in suspension until they reach the sea.

The locks will be constructed so as to contain four ships at a time, in order to reduce their operations without sensibly increasing their duration. With this object the entire works of the locks will be circumscribed within the upper dam of the river, which will permit the locking to be effected rapidly by the direct play of the deep water ducts along the full extent of the canal walls.

The gates of these locks will be thirty metres in width between the canal walls, and eighty metres in length from one busk to the other. The gates, when open, will give a passage of fifteen metres in width. These dimensions, for four vessels of a given size, will not appear exaggerated to men who observe the tendencies of naval architecture, but more especially in all that concerns the navigation of the Pacific. They will permet, during epochs of great activity in the navigation, the passage of more than three hundred vessels at day.

VATIMATED COST OF THE WORKS ON THE EASTERN

WESTERN BRANCH.

This branch is much shorter than that of the River San Juan; but by reason of the boldness of the configuration of the isthmus, and the extensive works planned for cutting it, the cann't of Salinas is, in reality, the principal feature of the enterprise, and necessitates an imposing accumula tion of forces if prompt execution be desired.

The cut of Salinas is the part of the line in which the project of M. Belly differs from those of all his predecessors. An examination of the anchorages of the Pacific coast in the region correspouting to the lake of Nicaragua demonstrates their mplete insufficiency for a great maritime movement At the south of this region the bay of Salinas presents, on the contrary, nautical conditions comparable to those of

At the south of this region the bay of Salinas presents, on the contrary, nautical conditions comparable to those of the best ports of the world. It is a deep, circular harbor, with a surface of five thousand hectares (about eleven thousand acres) without low shores, and whose depth, accurately sounded, varies from eight to fourteen metres. Its anchorage, protected by the small island steated at the entrance of its channel, is stated by French officers to be one of the best on the Pacific.

The construction of the Salinas canal will narrow the entrance of this bay and convert it into a close port, by means of an embankment taking its departure from the shore and formed of the rocky debris of the great projected cutting. It will be the much more opportune to convert into a port the bay of Salinas, from the fact that this port will be, in addition, furnished with a fine open road-stead, by the close contiguity of Thomas bay.

The magnificent bearings of the Bay of Salinas have therefore struck M. Belly as the natural and indisputable prot of the great maritime incovenient which is to be established in these regions, and as the normal debowers study of the conformation of the listinus, the study of the conformation of the listinus, the study of the conformation of the listinus, the study of the valley of the Espan—about six until it reaches the river Las Vueltas, the team will reache the listinus from the Pacific. It is at the river Las Vueltas that it is proposed to commence the grand cutting, at the bottom of which is to run the Salinas canal. This cutting, the length of which will be the kildshed and cutting at the bottom of which is to run the Salinas canal. This cutting, the length of which will be the kildshed and calcareous rocks.

The upper section of this canal, it should have been in the cuttinating point of the Salinas canal.

The presents an excavation of eleven millions of cubic evers, the greater portion of which is composed of argilleous and calcareous rocks.

The upper section of this canal, it should have been sted carries, by means of a single dam, the level of the let to Rispero. There commences the downward section, high is to empty the waters of the lake into the bay of time. The difference of level between the two extreme rates of this section, which is thirty-eight metres, is revived by means of six locks, of six metres forly constant. According to this plan, these six locks are separated by distances of two kilometres each. But it is doubted that a division be regular can be observed in the executed of the works, and it is more natural to admit that the regularities of the decline of the ground towards she searly more than the possible close locks, which have been found so ground towards to each of the possible close locks, which have been found as much as possible close locks, which have been found so ground towards the calculation of the distance of the Salimas canal will be regulated at eight metres, like that of the triver San Juan, as order to give passage to first class frigates and commercial visuals measuring 2,000 tons. With regard to the breadth of the canal, it is proposed to adopt that which was suggested by Garella for the Panama project, and which was also adopted for the Nicaragua canal by Lonis Napoledia, namely. 44 metres at the water line—a dimension which exceeds by 3 metres 702, that of the Caledonian canal.

ston which exceeds by 3 metres 70c that of the Carestonian canal.

The Salinas canal, whose breadth is fixed at 44 metres at the water line and at 40 metres at the bottom, is to be walled at the two sides to the height of two metres in some parts in massing, in some parts in wood, a scording to the choice of the adjacent materials. Under these conditions it presents a useful depth, and vessels may form a quay of each bank along the entire course of the canal.

The mass of excavation for the cutting of the canal of Salinas in its length of 22 kilometres from the lake to the sea will produce a volume of 7 400,000 cuttin metres. The dimensions of the looks will be in every respect the same as these of the other branch.

ESTIMATED COST OF THE WESTERN BRANCH.

The cut of Salinas, presenting a volume of 11,000,000 cubic metres of excavation, at 50c, the metre.

[grayation of canal, 7,400,000 cubic metres, \$5,500,000 at 50c. the metre.

Walling the banks of the canal, 340,000 superficial metres, at \$2 the metre.

Construction of six locks, with gates, at \$200,000 each 1,200,000 . \$11,080,000

THE NIAGARA FALLS SHIP CANAL. By an act of the Legislature of this State, passed July 21, 1853, the Niagara Falls Ship Canal Company was incorporated, for the purpose of connecting lakes Eric and Ontario by a ship canal, avoiding the fails of Niagara. Since then nothing tending to give practical effect to the designs of the company has been done; but, on the contrary, some swindling schemes of speculation in the stock of the concern have come to light within the last twelve months. At the last session of Congress, however, a bill was introduced in the House of Representatives by the

was introduced in the House of Representatives by the Hon. Silas M. Barroughs, proposing to donate, in aid of the great work, four millions of acres of the public lands. This bill was referred to a special committee, and nothing has since been heard of it.

The Welland Ship Canal now effects the same objects proposed to be effected by the Niagara Ship Canal. It connects the waters of Lakes Erie and obtaine by a main trunk twenty-eight miles in length, with a feeder branch of twenty-one miles from the Grand river to the main trunk.

of twenty-one miles from the Grand river to the main trunk.

The width at bottom is 35 feet and at top seventy-one feet, and its depth is ten feet. It has no less than twenty-seven locks—the level of Lake Erie being 330 feet above the level of Lake Ontario. It was built by the British government and was opened to navigation in 1829. The revenue derived from it is very large; and to this, as well as to the fact that its whole course is through British territory, is to be referred the project of building the Niagara ship canal, the whole course of which would be on the American side. Taking the length of this canal from Buffalo to Lewistown at forty miles, and assuming its cost to be equal to that of the Canadian canals, which average \$155,300 a mile, it would cost \$6,212,000. But it will be within the mark to set it down at ten millions. The St. Mary's Falls ship canal, which is little more than one mile in length, cost nearly a million of doilars. If the company could get the grant which it asks from Congress—four millions of acres of public lands—it might undertake to build the work; but otherwise, in view of its immense cost, and of its already having a rival in the Welland canal, it is not very likely that its projectors will seriously set about carrying it out.

LANE ERIE AND MICHIGAN SHIP CANAL.

LAKE ERIE AND MICHIGAN SHIP CANAL A much more stupendous and important project is that which has been discussed for some few years past of con-necting Lake Eric and Lake Michigan by a ship canal. An examination of the map of the United States will show the vast commercial importance of this work. Lakes Michigan, Huron and Eric form a sort of horse shoe, making a peninsula of the State of Michigan. A straight line run across the base of this would connect the southern point of Lake Michigan, at Michigan City, with the southwestern point of Lake Eric at Toledo. The distance is about 180 miles. The Michigan Southern and Northern Indiana miles. The Michigan Southern and Northern Indiana Raifroad now connects these points. In navigating the lakes, a vessel starting for Michigan City has to sail the entire length of the lake—330 miles—through the Mackinaw Straits at Lake Huron, down the entire length of Lake Huron—260 miles—then through the St. Clair river and lake into Eric, the whole distance from point to point being some 800 miles. This circhious route would be avoided, and fully 600 miles of navigation saved by the opening of the Lake Eric and Michigan ship canal. The average cost of the Illinois canals was \$34,546 a mile; but, assuming the cost of the Lake Eric and Michigan ship canal at \$10,000 a mile, its total cost would be eighteen millions of dollars. It would be of vast importance to the commercial interests of Bufalo and New York, as it would be the great connecting link with the Eric canal between the Atlantic and the great lakes.

THE TOPONTO AND GEORGIAN RAY CANAL. Seven dams, with locks, at \$200,000. \$1,400,000 Other causes besides those of facilitating commerce have recently brought the Frie and Michigan canal project o the attention of the people of Michigan, Illinoi and Indiana. The chief of these is a project that has been set on foot by the Canadians to connect Lake Ontario, at Toronto, with that portion of Lake Huron which is designated by the name of Georgian bay. If the project were consummated-and, in view of the great public enter prise of Canada so liberally fostered by the British govprise of Canada so liberally lostered by the Eritah government, it is by no means unlikely that it will be—
it would ruin the towns on Lake Frie and the southern shores of Lake Michigan, by diverting the commerce of the Lake Superior country through Georgian bay into Lake Ontarie, whence it would find an opening to the sea by the St. Lawrence; and in course of time the route from Chicago to Liverpool, that was pluneered some two or three years ago by the schooner Dean Richmond, would be the much heaten track of commerce. The projosed Toronto and Georgian Bay canal would be some eighty miles in length, extending from Nottawasaga, on the southern point of Georgian bay, through the valley of the Nottawassaga and Humber rivers, to Foronto. The gold discoveries on Fraser river and the immense importance recently given to the valleys of the Saskatchewan and Bed river of the North cannot fail to give a great impetus to this project. The cost of the canal, estimated at the average cost of the Canadian canais, would be \$12,424,000, we may safely set down at lifteen millions. Whichever of those two proposed works—the Lake Frie and Michigan ship canal, or the Toronto and Georgian Bay canal—will be first consummated will command the commerce of the five great inland seas of the North American continent—of which the aggregate length is 1,670 miles, with a breadth of 647 miles—and may eventually attract much of the trade of the Pacific. ernment, it is by no means unlikely that it will bethe Pacific

LAKE CHAMPLAIN AND ST. LAWRENCE CANAL.

In connection with the project of the Toronto and Geor gion Bay canal, it is also in contemplation to open a cana between lake Champlain and the river St. Lawrence, op. me Montreal, which would connect that noble river Histon, at Albany, by way of the Champian cary open between Whitehali and Albany—a sary three and a half miles. The Champian has a Lawrence canal would be some fifty miles in tenath, and could probably be built at an expanse of some five millions of dollars.

CANAL AROUND THE FALLS OF THE OHIO An effort was made at the last session of Congress to procure the passage of a bill having for its object the im provement of navigation at the Falls of the Ohio river. The proposition was that the United States should assign to the State of Kentucky all their interest in the existing canal around the Palls of the Ohio river, should appropriate canal around the Falls of the Ohio river, should appropriate the sum of \$300,000 towards its enlargement, and should also purchase, for the benedit of the same, twenty thousand shares of the capital stock of the Indiana Canal Company, at a cest not exceeding a million of dollars. Congress did not think proper to comply with these demands or any of them. From the extent of them, it may be as aimed that the cost of the work would not be less than five millions of dollars.

THE TEHUANTEPEC ROUTE.

One of the most prominent enterprises at the present time that is presented to capitalists in this country, is the opening of communications between the Atlantic States and California, across the Isthmus of Televantepec. Of all the lethmus routes between the two oceans, the one lies nearest to the United States, but the line of

transit is entirely in Mexican territory.

A grant of the route has been obtained from the govern ment of Mexico on terms advantageous to the company and to the liberty of international trade and transit, and a contract has been made with our own government for the conveyance of a semi-monthly mail to San Francisco. The port on the Atlantic side is the small town of Minatitian, on the Coatzacoalcos river, and about twenty miles from its mouth. From there the line of transit, as now in use, comprises river navigation in small steamers on the Contracosicos, about ninety-five miles, to the mouth of the Suchil, and from there in stage coaches across the Isthmus to the Bay of Ventosa, on the Pacido, about 120 miles.

From Ventosa the passengers are taken by steamship to Acapules, where they connect with the Pacific Mail Steam ship Company's steamers from Panama to San Francisco Up to the present time the communication from the Atlantic States is maintained solely by the steamship Quaker City, running from New Orleans to Minattilan, and ma-sengers leaving the first named port on the 12th and 27th of each month, emba,k at Acaputeo on board the same steamship that conveys the New York passengers of the 5th and 29th respectively.

The company have placed a new iron river steamer on the Coatzaccalcas river, and are about building a consort for her. The road is now stocked with source forty Concord stages and from 700 to 800 animais, and the company are prepared to take 400 passengers across each trip. They have recently purchased the steamers America and Catada, with the intention of establishing a weekly line of cotemunication to California. The opening of the communications with New York wait only the completion of the Fernandian and Cedar Keys Railroad across Florida, when a connection between New York and Minatitian will be established, which will make the passage in six days. With the present arrangements the company expect to carry the mail and passengers from New Orleans to California in fifteen days, and as soon as the Florida railroad is finished, to run from New York to San Francisco a weekly line in seventeen days.

A corps of engineers is now on the Isthmus performing the preparatory work of laying a railroad across from the Coatzaccalcas to the Pacific. The total expenditures of this company, when its works and lines of steam communication are completed, will not fall short of ten millions of dollars.

THE HONDURAS INTER-OCEANIC RAILWAY.

THE HONDURAS INTER-OCEANIC RAILWAY. The object of this enterprise is the construction of railway across the Isthmus of Central America, through the republic of Honduras, from Puerto Caballos, on the

distance of 161 miles.

The line is intended to establish a rapid route of transi for passengers and freight between the Atlantic and Pa-cific oceans, for the accommodation of European and American trade, primarily with California and Australia, and, secondarily, with the western republics of the Ame rican continent, the islands of the Pacific, and with the

recan continent, the islands of the Pacific, and with the centres of Oriental commerce in India, China and Japan. It is claimed by the projectors of the enterprise that by the proposed railway, and the development of the plans of the company in connection therewith, passengers, the public mails, specie and express freight can be transported between New York and San Francisco in from twelve to fourteen days, and general or heavy freight in from sixteen to seventeen days.

from sixteen to seventeen days.

The plan of the company contemplates two modes of reaching Puerto Caballos, the Atlantic terminus of the proposed road from New York. First, direct by sea for proposed road from New York. First, direct by sea for the transportation of second class passengers and such first class passengers as may prefer it. Second, by railway express through Philadelphia, Baltimore, Norfolk, Charleston, Savannah and the intermediate points, to Tampa Bay or Charlotte Harbor, in Florida; thence by steamer, touching at Havana, to Puerto Cabalios.

The following table will show the results in economy of time calculated upon by the company:

TIME AND DISTANCES RETWEEN NEW YORK AND SAN FRANCISCO, VIA BONDURAS.

Miles. Hours.

Bay of Fonseca to San Francisco, steamer. 2,220 185

Total 4,121 315

—or thirteen days four hours. 19 addition to the saving of time anticipated, it is contended that the salabrity of the Honduras climate gives this route a superiority over all the other Isthmus routes, which must eventually secure to it a monopoly of the travel between the two seas.

Berimarbe cost of Construction.

Preliminary expenses 900,000

Extinguishing titles to land 50,000

Extinguishing titles to land 50,000

Earthwork and excavations 1,932,000

Bridging 608,750

Culverts and passages 161,000

Superstructure 1,347,400

Stations, wharves, &c. 407,000

Equipment and rolling stock 355,000

Engineering contingencies, 30 per cent 1,485,345

Total 90,436,495

This gives an average cost per mile of not far from \$40,000.

Gress total. \$3,975,000

Estimated expense of working road \$50,000

Retimated expense of working road \$50,000

Net total. \$3,425,000

The surveys of the road have all been completed unde the direction of Mr. E. G. Squier, the projector of the company. The charter from Honduras has also been secured, and all that is now wanting to carry out the enter prise are the funds for the construction of the line. That they will soon be raised there can be no doubt, as the men at the head of the undertaking have the position and influence requisite to inspire confidence in its success. Mr. Squier is at present in London, engaged in the preliminary financial arrangements necessary to enable him to place a large force on the line, and,on his return it is expected that the work will be immediately proceeded with.

THE NEW MEXICAN PACIFIC PAILPOAD

The projectors of this line contend that it will be the shortest possible railroad route from all the commercial ities of the Atlantic, the Gulf and the great valley to the Pacific coast, and it is believed to be the only feasible rail-road to the Pacific, as it is the only one that can be built by private capital alone. It presents the distinguishing characteristic of being the fartnest north that a short transit of the Continent can be found, and the farthest south that a continuous railroad can be had from the Pacific to connect with our present railroad system. The particulars of the project are as follows:—If a line be drawn on the globe from New York tangent to the Gulf of Mexico, and protonged each way, it will cut the Pacific coast near Mazatlan, and, passing near the Society Islands, will strike Australia near Melbourne; whilst in the other direction it passes over Boston through Newfoundland, and strikes the western coast of Europe. Upon lines contiguous to this air line may be concentrated more of the world's commerce than upon any other possible route between the Pacific and Atlantic oceans. But the route is especially important in reference to our own country. It runs from the extreme northeast to the extreme southwest of the Atlantic States, uniting the factories of the North with the cotton fields of the South, and both with the gold and silver mines of Mexico, whilst the whole inhabitable region cast of the Rocky Mountains is also by it conveniently connected with our Pacific slope from Portland, in Maine, to New Orleans, by routes proximate to the direct line of railroad nearly completed. Various roads from the Atlantic coast, from the great takes and from the chief cities in the valley of the Mississippi, are tending towards the Southwest, and find their natural conjunction at Houston, Texas, where a road is now under construction towards the Rio Grande, in the direction of Mazatlan. The plan of the company demonstrates that there is a route through Mexico to the Pacific, by which the vexed question of an interoceania railway may be settled without trenching upon the treasury, the poblishands or the constitution. A grant has been secured from Mexico, giving exclusive right of way for ninety-time years, perpetual possession, exemption from all duties on materials and pre-pertual possession, exemption from all duties on materials and pre-pertual possession, exemption from all duties on present the whole subset to capitalists in a proper shape. The land

The Victoria Bridge, that has been for several years east in course of construction over the St. Lawrence at Montreal, will be, when completed, the grandest monu ment of engineering skill and homan enterprise to be seen on the continent, and will be indeed one of the wonderof the world. It is on the tubular principle, having a rack for railroad cars in the centre, while on the outside track for raifrond cars in the centre, while on the obtained of the tube there is to be a balcony on each side, with footpaths for passengers. It is to rest on twenty-four piers and two abutments of limestone masonry. The centre apan is to be 300 feet long and 60 feet in height over the summer water level of the river. Its total length will be 10.284 feet, or about fifty yards less than two miles. Its cost will be about \$10,000,066. It will probably be completed next year.

THE GREAT ALPINE TUNNEL. TR PROPOSED RAILWAY TUNNEL THROUGH THE ALPS-THE NECESSITY FOR THE WORK-PLANS OF DIFFERENT ENGINEERS-THE MACRINERY TO BE

Among those stopendous projects which characterise the present era of human progress, the proposed tun celling of the Aips for a railway stands prominent. The cessity for this work is to afford communication between Sedmont and Upper Italy, with facilities not afforded by mere animal means of transportation. The central part of the Sardinian States is Piedmont, which is divided by the river Po and its affluents Tanaro, Barmida, Clusone, Dora, Senia and others. In its eastern part the lands are extensive supply of agricultural products for exportation to neighbories States. The routes of the Simplon, Mont Cenis, St. Bernard and the Cul de Tenda cross the Alpefrom Piedment into Savoy on the porthwest. The Duchy of Sa voy has an area of 2,270 square miles, and a population of coo.000. It is in the basin of the Rhone, and is also watered by the Prouse, Arno, Isere and Arc. Cattle rearing is the principal branch of industry, though the land is generally so unfertile that barely enough is raised for home consumption. Savoy is the more important as be ing in the route from Italy to the north, and having or the border, between itself and Piedmont, the most fre quented mountain passes. Mont Conis, through a pass of which the proposed tunnel is to be built, is one of the most remarkable alpine summits, and the road which was built by the French in 1808 to 1811 is one of the most frepoented across the Alps.

Victor Emanuel Radroad will traverse the whole breadth of the Alps, benefitting not only the immediately ad-joining provinces, but effecting a chain of transportation

in which the whole of Central Europe is interested

There have been many plans for this stupendous work.

R is generally conceded that the most available route is through the pass of Mont Cenis, from Modane, a small town in Savoy, to Bardonneche, another small town on the south side of the Alps, in Piedmont. And at the precise point of the pass selected, the two valleys of the Arc and Dora, in which these towns are situated, are on a level; the one, however, having a plane descending from east passage the Mont Cenis is about thirteen kilometres deep, passage the most cents is about thirteen knowletes deep, so as to render impracticable any design to sink shafts so as to work the tunnel at various points. But, even supposing this could be done, it was estimated that the present facility for boring tunnels would not enable the completion of the work in less than forty-six years. Then it was feared that no plan could be found for supplying the immense tength of the subterranean cavern with air. For many years these objections have deterred the serious consideration of the work as at all feasible. But of late years there has been much attention paid to the subject, and the Sardinian government has appointed a commission to investi-

gate the propositions of several engineers.

As early as 1849, M. Mauss, a Belgian engineer, pro. posed to the Sardinian government a plan for the tunnel, commeucing simultaneously at different points. But the question of the supply of air was an insurmountable ob-

question of the supply of air was an insurmountable obstacle. It was proposed to drill, by means of water
power, horizontal slices, which were to be burst out with
wedges. One commission appointed by the Sardinian
government approved this plan; but the loss of power in
employing such a long hose, and the air question, prevented the consummation of M. Mauss's plan.
Six years later, M. Colladon, of Geneva, presented a
plan on the principle of compressed air, used at the
same time for power and ventilation, and about the
same time for power and ventilation, and about the
same time for power and ventilation, and about the
same time for power and ventilation, and about the
same time for power and the same time for power and
the victor Emanuel road, invented an ingenious machine
for perforating rocks. It was at first considered impossible to use the steam machine in the tunnel; but soon the
idea was suggested that the compressed air idea of Mr.
Colladon's invention would be of use in producing a machine which would drive Mr. Bartlett's drills, and supply
the needed ventilation.

This desideratum was accomplished by three Sardinian
engineers, Messrs. Grandis, Grattone and Sommelliter,
who invented a machine for perforating the rock, ventilating the tunnel, and clearing away the rubbish, which
they call the compresseur hydraulique, with which, having
a full of water of twenty metres, it has been possible to
compress air at six atmospheres. It is easy to conjecture
how this immense force may be used in blasting and blowing away the rubbish, and be applied to all the arts of the
borer and miner.

A number of eminent geologists have attentively studied

a full of water of twenty merces, it has been possible to compress air at six atmospheres. It is easy to conjecture how this immense force may be used in blasting and blowing away the rubbish, and be applied to all the arts of the borre and miner.

A number of eminent geologists have attentively studied the ground, and coincide in the report that quartzine alone offers great resistance to perforation, and the stratum of this to be bored is not of considerable size. The results of the extended experiments made by the commission of the Sardinian government were that, at a distance of one-half the length of the tunnel a force of six atmospheres is reduced to but about one atmosphere and one third, with the ordinary machine. This force would be amply sufficient for the work, and the question of supplying air is set at rest at the same time. The power thus gained was applied to Mr. Bartlett's machine, and the success of the substitution of air power for steam power was complete, as it was also when applied to perforators.

The effect of this invention upon mining is general, as well as upon this particular project, will be most beneficial. It has been estimated that the ordinary time required in mining operations is three-quariers for boring and one-quarter for blasting and clearing; it must be evident, therefore, that the acceleration of the boring process by this machine greatly tends to diminish the required time for completing the work. The perforators occupy so little space that eighteen may be placed where only three couples of miners could work.

In order to facilitate the work, it has been decided to bore near the great tunnel gallery a second smaller one, to facilitate the removal of rubbish. The larger will follow the smaller at a distance of about 200 metres. In this manner of operation the projectors estimate their ability to complete the work in six years. They propose to advance as metrea per day, while under the old method but half a metre could be gained.

The total length of the tunnel would be twel

THE GREAT HOOSIC TUNNEN. In the year 1853 Peter Clark, J. V. C. Smith and others with them associated, presented a petition to the Massa-chusetts Legislature, in which they set forth that they had obtained a charter for a railway from Greenfield, Mass., passing up the valley of the Deerfield river to Hoosic Mountain, in the town of Florida, and from thence to North Adams and Williamstown, to the dividing line between Vermont and Massachusetts. To construct this railway, it would be necessary to tunnel setts, and adjacent to the lines between that State, Verment and New York. The State of Massachusetts had previously aided the Western Railway Company with a loan, and the new corporation alluded to above asked a similar help to the amount of two million dollars, the estinated cost of the tunnel.

The petition was referred to a joint special committee of the Legislature, and admirable reports were made by said committee. The report before us, bearing date February, 1854, states that the committee is satisfied that the railway will open a new avenue, by which the products of the West may find an outlet at Boston at a considerable reduction in the freight practicable; that it could be easily lighted and ventilated both during its progress and after completion; [that the tunnel would greatly reduce distance, gradients. urves, and summits; that it would diminish friction and nercare speed, despatch, and safety; reduce the cost of travelling and transportation, and in consequence reduce the est of provisions, stimulate manufactures, and greatly inrease the exports and imports of the State. It should be noticed here that the freighting business has heretofore been transacted by the Western railway from Albany to Boston. This road passes for fifty miles or more through a mounminous country, and has necessarily steep gradients and sharp curves. The freight tariff is high and the trains slow also-a matter of course. The new road has but one obstacle-the mountain already alluded to. The entire length of the proposed tunnel is 24,100 lineal feet; the amount of earth to be excavated, 361,500 entic yards; the estimated cost, \$1,948,557; and it was calculated that 1,500 days would be required to complete the work. The State geologist, Professor Edward Hitchcock, President of Amherst College, made a survey of the route of the railway. He was confident, from the of the route of the railway. He was confident, from the geological formation of the mountan, that it was composed of talcose or mica slate, with a little limestone on the western side extending to a great depth in regular vertical ayers. He metanced a case in which the same range had been cut down by a stream fourteen bundred feet, and it exhibited the same formation. He traced to their origin in Northern New York a few granite boulders found on the mountain and ascribed their removal to debergs at some remote period of time. He expressed confidence, also, that the recs from its position would be self sustaining and require no masonry; that it would be in a great measure free from water, while it would be in a great measure free from water, while it would be in a great stem bore which cut its way into coarse granite at the rate of four inches per hour, opening a space of seventeen feet in dameter. Subsequently the report, which has since been ascertained to have been practically correct, was adopted. The Lembsture passed an act pledging the State credit for the company to the amount of two millions, taking as security a mortgage on the property of the road, valued at a millions.

The following are the conditions of the act of 1854 under which State aid is granted:—

1. That the Troy and Greenfield Railroad Company, at an annual or special meeting, duly notified for that purpose, shall assent to the provisions of the same.

2. That the company shall execute a bond in such form or the Attorney General preservised in the issuing of State broad to the Western Railroad Company, with conditions as named in the act.

3. The company shall execute a mortgage to the State of the entire railroad of said corporation, with its income and all the franchise and property to them belonging, the whole to be field by the commonwealth to secure the performance of the conditions of the bend.

4. The company shall execute a bond in such formand company. geological formation of the mountan, that it was composed

4. The company shall assign to the state at the interest to now has or may obtain in the Southern Vermont Rairond Company.

5. That the company shall have obtained subscription to the capital stock in the sum of \$600,000 (six hundred thousand dollars).

6. That twenty per ceatum on each and every share shall have been actually paid in.

7. They shall have completed seven miles of their railroad in one or two sections.

8. That they shall have completed one thousand lineal feet of their sail tannel under the Hoosac mountain, in one or more sections, in size sufficient for one or more railroad tracks.

The railway and tunnel were duly commenced under the provisions of the act, and early during the present year the company notified the State authorities that the work, so far as it had been completed, was ready for inspection. Thereupon his Excellency the Governor, Mr. Banks, appended a committee of his councillors to inspect the operations of the company. This official visit was made on the 2d September. The committee entered the eastern cod of the tunnel, towards lisaton, then passed ever the mountain for the purpose of examining the west end and

the section of read built from the depot at North Adams to the Stafe line of Vermont.

the section of read built from the depot at North Adams to the State line of Vermopt.

They found the road completed, and in running order to the State line, being 534 feet less than seven mides. The rail is of superior quality, weighing fifty-eight pounds to the vard, made of American iron, at the Rensselaer Works at Troy, New York, and is beavier than the confractors were to furnish (ralls of forty-five pounds to the yard were required). The same contractors have undertaken the hulding of the line to Troy through the southern part at Vermont, and it is expected that the connection wit Troy will be completed in four or five mouths.

The length of tunnel on both sides the mountain is 1,023 feet, and the headings 263 feet in addition, which gives the required excavation of 1,000 feet and excess of 28 feet full size required. And 263 feet more of the work fully one shalf completed.

The tunnel on the eastern side of the mountain is worked in solid rock, forming an arch as enduring as the mountain itself, and its height is fully sixteen feet. The whole height of tunnel on the eastern side is 976 feet, of which 188 is cut full size. The entire depth of tunnel on western side is 240 feet, full size, with an additional heading of 75 feet. The west end, though harder to work, the rock is not as firm as on the eastern, and it is found necessary to support the roof of the tunnel by timbers. From test shafts already such beyond the present heading, the contractors are satisfied that a different formation will very soon be reached, in which no artificial supports will be required, but which will, like the mica slate of the east end, be self-supporting.

A mortgage of the entire railroad of the corporation, with its income and all the franchise and property to them belonging, was executed in 1855, and is now held by the State to secure the fulfilment of the conditions upon which the loan of credit has been made; and the company has assigned to the State all interest it had, or that it may hereafter obtain, in the Southern

\$4,372,500.

The new railway will run nearly parallel with the Western. It will connect easterly with the Fitchburg and Lowell, which have connections with all the main lines in New England—north, south, east and west. At Troy it will connect with the Northern railways to Canada and Vermont, and with the New York Central to the West; also with the Hudson River to New York city.

REPORN TUNNEL.

The Eric Railroad Company commenced the digging of this famous tunnel in May, 1856. The entire length of the excavation is 7,100 feet—the tunnel proper, or covered part, being 4,300 feet. The excavations are at some places full 100 feet deep. The estimated total cost of the construc-tion is \$715,000, of which \$515,000 have already been expended. From ten to twelve hundred persons have expended. From ten to twelve hundred persons have ordinarily been employed on the tunnel. It is estimated that the Brie Railroad Company will save, by the completion of the tunnel, a direct expenditure of at least \$150,000 in ferriage and otherwise, besides the increase of their business, on account of this new facility. There will also be a gain or saving of twelve hours time on their freight from this city to the lakes. Eleven miles are saved in distance by the tunnel, while twenty-four miles of railroad are substituted for an equal distance of river navieation.

THE ATLANTIC TELEGRAPH. The Atlantic Telegraph Company is not at all diouraged at the partial failure of its last enterprise in connecting Europe and America by electric telegraph. On the contrary, they are again before the British government with a proposition for laying down a new cable. All they ask is that the government will guarantee the payment of four and a half per cent interest on the capital requisite for new operations, and which is limited to £557,000, or about two and a half millions of dollars. It is not at all likely that the British government will refuse its assent to this modest request, because if the line is once fairly established it will certainly yield large profits, and the government will incur no risk in giving the guarantee. It is only in case of railure on the part of the company that the government will be called upon to pay the interest on the capital invested, and that will in no case exceed \$120,000 a year. Should our government join that of England in the guarantee, the liability of each under it would be only \$60,000 a year. As an instance of the immense value to England of a transatlantic telegraph, we may mention the fact of its being enabled, while the line was no operation, to countermand an order which had been previously given for two regiments stationed in Canada to embark for India—the necessity for such draft of troops having ended. This one message saved to the England government more than its entire yearly subsidy; and having thus realized the advantages of an Atlantic telegraph line, it is not at all likely that it will shrink from any expense necessary to establish one.

So soon as the guarantee is produced from England the company will go to work and day down another line on the most approved plan, and will in the meantime set to work to utilize that aircady laid. There is little doubt that in this they will be at least measurably successful. its assent to this modest request, because if the line is once

ATLANTIC AND PACIFIC TELEGRAPH.

Independently of the proposed Pacific Railroad, there is a project on foot to establish a telegraph line between San rancisco and the Missouri river, and at the last session of Congress a bill was introduced by Senator Douglas proposfor sending government despatches over the line. Some progres has been already made on the California side. The total cost of the line would probably be a million and a baif of dollars.

RECAPITULATION.	
	450,000,000
Do one British line	
Suez Ship Canal	40,000,000
Nicuregua Ship Canai	24,000,000
Ningara Falls Canal	10,000,000
Lake Erie and Michigan Canal	18,000,000
Toronto and Georgian Bay Canal	15,000,000
Lake Champlain and St. Lawrence Canal	5,000,000
Ohio Falls Canal	5,000,000
Tehuantepec route	10,000,000
Honduras Railroad	7.000,000
Central Mexican Rajlroad	15,000,000
The Victoria Bridge over the St. Lawrence at	Takanakana
Montreal	10,000,000
Alps Tonnei	5,000,000
Hoeste Tunnel	2,000,000
Bergen Tunnel	715.000
Attantic Telegraph—second line	2,500,000
Atlantic and Pacific Telegraph	1,500,000
Grand total	3770,715,000

The Financial Condition of Minnesota. TO THE EDITOR OF THE HERALD.

NEW YORK, Dec. 28, 1858. It is my duty as the Governor of the State of Minnesota to correct publicly certain misrepresentations which have been made here relative to the bonds of that State, issued. or to be issued, by virtue of a constitutional provision, as a loan to expedite the construction of rullroads within her limits. I propose to effect this by making a plain state-ment of facts, leaving your readers and the public generally to draw their own conclusions therefrom.

The constitution of the State of Minnesota, as originally

framed and adopted by her people, restricted the public debt-except in cases of invasion or insurrection-to \$250,000. Subsequently it became evident that, to inthe State had received from Cougress a munificent grant of land, the State must lend her aid to those companies

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developing her resources, the loan amendment was adopted, as has been stated, with a singular unanimity. Minnesota is much the largest State in the Northwest, being more than twice the size of lowa, and in her climate, soil and the excellence of her cereal productions she is not surpassed. Her population is composed mainly of emigrants from New England, New York, Pennsylvania and the Western States. The rapidity with which she has advanced is without precedent, even in the history of the West. In 1850 her census tables showed less than 6,000 people, and a comparatively small amount of property. In 1858, although no regular census has been taken, it is estimated that her population amounts to nearly a quarter of a million, and the Auditor of the State reports the taxable property to be more than \$50,000,000.

In view of this statement of facts, the simple question for capitalists to determine is, whether the bonds of Minnesota, issued with the sanction of a vast majority of her people, without distinction of party, and backed by securities of unquestionable character and value, are not as desirable as a means of investment as those of any other State in the Union.

The work upon each of the four railroads has been prosecuted with great vigor, and no bonds are issued by the Governor until they are thorsughly examined and reported upon under each, by competent engineers appointed by him for that purpose.

n under oath, by company a for that purpose, HENRY H. SIBLEY, Governor of Minnesota.

HENRY H. SIBLEY, Governor of Missourt.

Message of the Governor of Missourt.

The Missouri Legislature permanently organized at Jefferson on the 29th inst. by the election of Mr. Coffey, democrat, as Speaker, Mr. Mosely Clerk of the House, and Mr. Hough Secretary of the Senate. The Governor's message says the amount received into the treasury for the two years ending Oct. I was \$1,361,000, and the expenditures \$1,152,000. In speaking of railroads he says the amount loaned by the State is \$24,900,000, of which bonds have been issued to the amount of \$19,056,000, leaving an amount due of \$5,894,000. The Hannibal and St. Jeseph road has exhausted the aid granted, but asks no further assistance from the State. The completion of the Pacific road to Kannas City demands additional aid, which the Govern r hopes will not be withheld. The North Missouri and from Mountain roads have declared their inability to pay the interest on the State bonds on the list of January. This failure involves the sale of the roads at auction, but, in consideration of the early completion of the North Missouri to its intersection with the Hannibal and St. Josephs road, which will piace if on a paying basis, and the limited business of the from Mountain road, in consequence of the general depression of business and the inability of the company to derive the benefit of the balance due from the State under the restriction of the act of the last Legislature until March 1, the Governor advises that, instead of selling the defaulting roads, measures be taken to assure the State of the faithful application of the receipts of companies to their legitimate purposes, and that they be allowed, until a fair opportunity is offered them, to test their ability to pay. The geological survey is progressing rapidly, and disclosing exhaustices quantities of iron, lead, copper and coal. Some additional legislation is suggested in order to harmonize the different interests growing out of the banking law. As an evidence of the advancement of the cause of educatio Message of the Governor of Missourt.

TO THE EDITOR OF THE HERALD.

New York, Dec. 30, 1858. In to day's issue of your valuable paper I find that your In to day's issue of your valuable paper I find that your reporter styles the man who brutally assaulted the French sallor, Le Fort, at the Tombs, as an Italian. That man'n name, however, as it stands spelled in your columns, looks quite a French, and not an Italian one. From other cases of daily occurrence, I am led to suppose that your reporter, in ignorance, or in the congenial persuit of slandering the Italian antion, and prejudicing it in the eyes of the public, made the alluded insimuation. In fact, the Sourrier des Elect Uris itself, so fond of finding Maliano impeached in criminal matters, keeps silent as to the sationality of the guilty party, and this, in my opinion, speaks for itself. Now, if the case admits of a rectification, by inserting it in your paper you will greatly oblige a constant reader of it.

AVO. GIOVANNI SALANI, 49 Chatham street, N. Y.